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## Annex 3

Vulnerability of North Vietnamese Rice Crop to FloodingIntroduction

Rice is the major item in the diet of the North Vietnamese people, accounting for roughly two-thirds of their total caloric intake. Production of rice in North Vietnam during the past five years has averaged about 4.5 million tons.\* With this level of rice production, the average daily diet of the North Vietnamese population is estimated to be several hundred calories less than that required for body health and normal activity. Availability of rice per capita in North Vietnam has been trending downward in recent years and any substantial decrease in production of rice could have a disproportionately adverse effect on the health and productivity of the North Vietnamese people, unless offset by imports.

Vulnerability of the 1965 Rice Crop

The possibility of damage to the North Vietnamese rice crop during 1965 is now confined to the late crop. Harvesting of the early rice crop, which normally accounts for about one-third of the total, is currently in its final stages. Available information does not indicate an early rice crop either substantially better or worse than average. The late rice crop -- accounting for two-thirds of the total rice harvest -- is transplanted in July and early August and is harvested in October and November.

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\* Tonnage is in metric tons.

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required: =  
2300 calories  
2000 actual in NV

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Damage to the late rice crop would be the greatest if the levees in the Red River (Tonkin) Delta were breached during the latter part of July or in early August. During this period, the level of the river is normally high so that the extent of the area flooded and the destruction to levees bordering the paddy fields, the drainage canals, irrigation ditches, etc., would be great. Flash floods, which are common during July and August, would prolong the flooding once the levees are breached. The timely transplanting of the late rice crop, which is crucial for high yield and for the timely preparation of paddy fields for next year's early rice crop, would be interrupted. Rice transplanted prior to the breaching of the levees would be especially vulnerable and a large proportion of the rice shoots (seed beds) awaiting transplanting would probably be destroyed. Limitations on the amount of labor available would make difficult the simultaneous repair of the damage to the levees and paddies and the transplanting of the rice.

Since the Tonkin Delta plain slopes away from the Red River in both directions, the breaching of the levee on either side would cause severe flooding. Damage to the late rice crop, however, would be greatest if the left (northeastern) levee is breached since the area to the left of the river is almost entirely under late rice. In contrast, late rice covers less than one-half of the area to the right of the Red River since this area is normally too wet for crop raising during the monsoonal season.

The extent of the flooding and consequent crop damage that can be expected in the Tonkin Delta is dependent upon a number of factors: the rate of flow of the Red River when the levees are breached, the amount of water already on

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the plain as a result of current precipitation, and the number of breaches in the main levee as well as in the secondary levees which subdivide the plain into compartments. These secondary levees have tended to confine the damage from major floods in the past to roughly 200,000 hectares or to almost a fourth of the total area of the plain. Thus, breaches in the main levee probably could be expected to flood an area of up to several hundred thousand hectares.\* If in addition the secondary levees were effectively breached, theoretically almost the entire plain could be flooded. We have not made an analysis of the operational feasibility of large-scale levee breaching. However, as a first approximation, it is doubtful that more than about half a million hectares (or 60 percent) could be flooded.\*\* If only the main levee were breached, the loss probably would be on the order of several hundred thousand tons of rice or less than 10 percent of the average total crop in recent years. Even if the secondary levees also are effectively breached, the decrease in rice production in 1965 is unlikely to exceed three quarters of a million tons.

#### Probably Effects of Flooding

World supplies of rice and wheat are more than ample to permit North Vietnamese imports of the magnitude needed to replace any likely losses from flooding. Among the three major rice exporters in Southeast Asia, Thailand, Cambodia and Burma are most important. Rice exports from these three countries totalled 3.5-4.0 million metric tons in 1964.

\* One hectare is equal to 2.471 acres.

\*\* Damage to industrial installations from flooding in the Tonkin Delta would not be extensive unless the immediate environs of Hanoi were flooded to a substantial depth.

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Rice production in Communist China is on the order of 75-80 million tons annually. China normally exports only a very small quantity of rice -- about one-half million tons -- but despite their own tight grain situation the Chinese probably would have little difficulty in releasing the relatively small quantity of rice that the North Vietnamese would need. The Chinese could compensate for these rice exports by increased purchases of wheat from the Free World. World wheat production in 1964 set a new record of almost 9.2 billion bushels (about 250 million tons). The five major wheat exporting countries-- US, Canada, France, Australia, and Argentina -- all had good wheat harvests. Supplies available on 1 May 1965 for export or carryover (after deducting domestic requirements for the entire season) excluding US amounted to slightly more than 1.0 billion bushels (about 27 million tons) for the three major exporters -- Canada, Australia, and Argentina. This amount is about the same as in the previous two years.

If a completely successful attack were to achieve a significant reduction in North Vietnam's food supplies, which the Chinese or Soviets were unsuccessful in making good for some unknown reason, the Hanoi regime would undoubtedly impose selective rationing. The military forces and essential industrial and government workers would continue to be fed adequately. It would be the least important sectors of the population, such as old people, who would suffer deprivation. Hence, an attack on the rice crop by flooding the Tonkin Delta would be unlikely to achieve a significant military impact. Further, it would almost certainly

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incense world opinion against the United States as the perpetrator of an inhumanitarian act, and could strengthen the will of the North Vietnamese to resist.

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